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Docket No. 2224-142P

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of : Before the Board of Appeals
Yukiko NAKANISHI et al. : Appeal No.:
Serial No.: 09/145,987 : Group: 1623
Filed: September 3, 1998 : Examiner: E. WHITE
For: CELLULOSE ACETATE AND DOPE CONTAINING THE SAME

June 8, 2001

APPEAL BRIEF



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JUN 13 2001

TECH CENTER 1600/2900
PATENT

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TABLE OF CONTENTS

1.	<u>REAL PARTY IN INTEREST</u>	1
2.	<u>RELATED APPEALS AND INTERFERENCES</u>	2
3.	<u>STATUS OF CLAIMS</u>	2
4.	<u>STATUS OF AMENDMENTS</u>	2
5.	<u>SUMMARY OF THE INVENTION</u>	2-4
6.	<u>ISSUES</u>	5
7.	<u>GROUPING OF CLAIMS</u>	5
8.	<u>ARGUMENTS</u>	5
	A. <u>The Ishii reference</u>	5-8
	B. <u>Seo in view of Ishii</u>	9-10
	C. <u>Conclusion</u>	10-12
9.	<u>APPENDIX</u>	13-17



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Assistant Commissioner for Patents
Washington, D.C. 20231

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Sir:

This Appeal Brief is respectfully submitted on behalf of the Appellants in connection with the above-identified application.

This is an appeal from the Final Rejection of claims 1-13 and 15-22, which claims were finally rejected in the Office Action dated December 21, 2000. A Notice of Appeal was filed on April 18, 2001.

1. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Assignee, DAICEL CHEMICAL INDUSTRIES, LTD.

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2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

3. STATUS OF CLAIMS

Claims 1-13 and 15-22 are pending in this application, and the rejections thereof are hereby Appealed.

4. STATUS OF AMENDMENTS

No Amendment was filed subsequent to the mailing of the Final Rejection. The statement in the Advisory Action of April 2, 2001 that a proposed Amendment will be entered upon Appeal referred to Applicants' non-amendatory Response filed March 15, 2001.

5. SUMMARY OF THE INVENTION

Cellulose acetate is useful for the production of films and fibers. When used as a substrate for photosensitive materials, as a liquid crystal protective film, or as a color film, cellulose triacetate film is required to have satisfactory optical characteristics, including high transparency, a low yellowness index, low haze characteristics, and low birefringence. When cellulose diacetate is used in the production of fibers, it is required to have good spinnability characteristics. Specification, page 1, lines 4-23.

Cellulose acetate film is generally produced by the acetylation of pulp, casting a solution (dope) containing the resulting cellulose acetate and a solvent onto a support, and releasing the resulting film from the support. The use of a linter pulp generally makes this process too costly. Supplies of high purity softwood pulp are not consistently available. Low purity softwood pulp produces cellulose acetate that is insufficiently transparent. Hardwood pulp provides a cast film with unsatisfactory release properties. Also, cellulose acetate obtained from low purity pulp has decreased spinnability. Specification, page 1, line 24 – page 2, line 16.

In one embodiment, the present invention is based upon the discovery that the form of the carboxyl group binding to the cellulose acetate has a remarkable effect on the releasability and transparency of a cellulose acetate film and on the spinnability of a cellulose acetate dope. In another embodiment, the present invention is based upon the discovery that the alkali or alkaline earth metal content in the cellulose acetate has a remarkable effect on the releasability and transparency of a cellulose acetate film and on the spinnability of a cellulose acetate dope. Specification, page 3, lines 8-15.

In a first aspect, the present invention provides a cellulose acetate obtained by the reaction of a cellulose with acetic anhydride in the presence of a sulfuric acid catalyst, wherein (i) the cellulose acetate has carboxyl groups and at least part of the carboxyl groups are free carboxyl groups. In this aspect, preferably at least about 30 mole-% of the total carboxyl groups bound to the cellulose acetate

are free carboxyl groups. Specification, page 13, lines 17-27.

In a second aspect, the present invention provides a cellulose acetate obtained by the reaction of a cellulose with acetic anhydride in the presence of a sulfuric acid catalyst, wherein (ii) the cellulose acetate contains an acid having an acid dissociation exponent pKa of 1.93 to 4.50 in water, or an alkali or alkaline earth metal salt of that acid, to generate free carboxyl groups. Claim 1. The total content of the acid and metal salt thereof is set at a level which does not interfere with releasability, transparency, or spinnability. Specification, page 17, line 22 – page 18, line 3.

In a third aspect, the present invention provides a cellulose acetate obtained by the reaction of a cellulose with acetic anhydride in the presence of a sulfuric acid catalyst, wherein (iii) the cellulose acetate contains an alkali or alkaline earth metal and the total content of the metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent, to generate free carboxyl groups. Claim 1. The maximum level of the metal is set at a level that does not interfere with heat resistance of the cellulose acetate. Specification, page 19, lines 2-23.

In summary, then, a crucial feature of the present invention resides in the fact that a carboxyl group derived from cellulose as a raw material is retained in the form of a free carboxyl group, for example by using or adding an acid having a pKa of 1.93-4.50, that is, stronger than acetic acid.

6. ISSUES

The sole issues on appeal are whether claims 1-13 and 15-22 are unpatentable under 35 USC 103(a) over Ishii, and whether claims 18-21 are unpatentable under 35 USC 103(a) over Seo in view of Ishii.

The rejection under 35 USC 112 that was stated in the Final Rejection has been withdrawn – see the Advisory Action that was mailed on April 2, 2001.

7. GROUPING OF CLAIMS

Claims 1-13 and 15-22 distinguish over the references of record as discussed hereinbelow. Claims 2 and 3 distinguish over the references of record for all of the reasons relevant to claims 1, 4-13, and 15-22, and for an additional reason, as discussed hereinbelow.

8. ARGUMENTS

A. The Ishii reference

Claims 1-13 and 15-22 were rejected under 35 USC § 103(a) as being unpatentable over US 3,816,150 (Ishii). This rejection is respectfully traversed.

CLAIMS 2 AND 3. The Final Rejection contains language, the sense of which is:

Applicants argue against the rejection on the grounds that the Ishii patent fails to teach the characteristics (i)-(iii) of the present invention. This argument is not persuasive since the Ishii patent does indeed teach a cellulose acetate comprising at least one of the claimed characteristics, namely, feature (ii).

Page 2, paragraph number 6. This analysis by the Examiner ignores the fact that claims 2 and 3 require at least feature (iii). It is respectfully submitted therefore, that claims 2 and 3 are separately patentable for this additional reason.

Ishii describes a process for making modified cellulose acetate which comprises forming or molding a mixed cellulose ester. The ester is made by esterifying (a) cellulose with (b) acetic acid and (c) polybasic carboxylic acid. The molded product is then treated with a liquid treating agent which consists of an aqueous solution of a water-soluble, polyvalent metal salt. According to Ishii, the mixed ester of cellulose is treated with a divalent or higher metal salt in order to increase the solvent resistance. See Ishii, column 2, lines 37-41.

The carboxyl group content in the cellulose mixed ester of Ishii is at least several times greater than that in the cellulose acetate of the present invention. In more detail, since a very large carboxyl group content is required in order to improve solvent resistance of an article comprising a cellulose mixed ester by crosslinking, carboxyl groups are introduced into the cellulose mixed ester by esterification with a polybasic carboxylic acid. In contrast, the present invention employs the knowledge that a form of a carboxyl group derived from cellulose as a raw material has an effect on releasability in film production processes and spinnability in spinning processes.

Concretely, Ishii discloses that “the preferred degree of polybasic carboxylic acid substitution (for hydroxyl) of the resulting mixed ester of cellulose is above 0.05, particularly above 0.15” and “the preferred total degree of substitution is

above 2.3, particularly above 2.4". Column 2, lines 25-30. Even when the degree of polybasic carboxylic acid substitution is smallest (i.e., it would be estimated that the content of carboxyl group is smallest), the carboxyl group content is at least 5 times larger than that of the present invention. That is, the carboxyl group content of the mixed ester of Ishii can be calculated – on the assumption that the DS of cellulose acetate is 2.4, the polybasic carboxylic acid is maleic anhydride (molecular weight 116), and the molecular weight of an anhydroglucose unit of the mixed ester is 268 – as follows: $0.05 \text{ meq}/268 \text{ g of mixed ester} = 50 \text{ meq}/268 \text{ g of mixed ester} = 19 \text{ meq}/100 \text{ g of mixed ester}$.

In contrast, referring to the present invention, the carboxyl group content in pulp as a raw material is 3 to 7 meq/100 g. Thus, the carboxyl group content in the cellulose acetate of the present invention can be calculated – on the assumption that the DS of cellulose acetate is 2.4 and the molecular weight of an anhydroglucose unit of the cellulose acetate is 263 – as follows: $3 \text{ to } 7 \text{ meq}/100 \text{ g of pulp} = 3 \text{ to } 7 \text{ meq}/(100 \times 263/162) \text{ g of cellulose acetate} = 3 \text{ to } 7 \text{ meq}/162 \text{ g of cellulose acetate} = 2 \text{ to } 4 \text{ meq}/100 \text{ g of cellulose acetate}$. (Incidentally, this carboxyl group content represents the value using bleached kraft pulp – a carboxyl group content using a high purity of dissolving pulp for cellulose acetate would be even smaller.)

In order to emphasize an important difference between the presently claimed compositions and compositions disclosed by the Ishii reference, the present claims expressly refer to free carboxyl group content with respect to all

three of the possible “features” of the invention.

Ishii fails to teach or suggest features (i), (ii), or (iii) of the present invention. In more detail, Ishii requires forming a polyvalent metal salt with a polybasic carboxylic acid residue derived from the esterification reaction of a cellulose and a polybasic carboxylic acid in order to crosslink for improving solvent resistance. Ishii thus does not suggest to generate or retain free carboxyl groups binding to the cellulose acetate which is soluble in an organic solvent.

Moreover, unexpected effects are obtained in accordance with the present invention. Thus, Ishii fails to teach or suggest the releasability, optical characteristics, and spinnability that characterize the composition of the present invention. In particular, Ishii requires the treatment of a carboxyl group with a divalent or higher metal salt for high solvent resistance of the cellulose ester. Ishii certainly does not suggest that such properties could be obtained by carboxyl group containing cellulose derivative soluble in an organic solvent as required by the present claims.

Clearly, the Ishii reference does not render the invention as presently claimed *prima facie* obvious. Accordingly, the rejection of claims 1-13 and 15-22 under 35 U.S.C. § 103(a) over Ishii alone should not be sustained.

B. Seo in view of Ishii

Claims 18-21 were rejected under 35 USC § 103(a) as being obvious over US 5,240,665 (Seo) in view of Ishii. This rejection is respectfully traversed.

Seo describes a process for producing cellulose acetate fibers wherein cellulose acetate, acetone, a metal oxide precursor, acid, and water are mixed to form a solution which is then filtered and spun. According to Seo, the cellulose acetate fiber is produced from a cellulose acetate/acetone dope solution by a dry spinning technique. See column 1, lines 31-34. In Seo, the speed for production of a shaped article is increased without aggravating the tensile properties by adding the metal oxide precursor. Column 2, lines 19-24.

Neither Seo nor Ishii, alone or in combination, discloses the organic solvent-soluble cellulose acetates having carboxyl groups required by the present claims. Moreover, with respect to a dope, Seo fails to disclose or suggest any role for a free carboxyl group binding to the cellulose acetate; instead Seo employs a conventional cellulose acetate. Even if Seo is combined with Ishii, the dope obtained would contain a great deal of a polyvalent metal, thus corresponding to the dope of Comparative Example 1 herein. As reported in lines 2-21 on page 32 of the specification, the releasability of this dope evaluates as “x” (that is, not smoothly). Thus the Seo-type dope cannot match the qualities of the dope defined by the present claims.

Additionally, Ishii promotes the increase of solvent resistance. In Ishii, the carboxyl groups derived from the polybasic carboxylic acid residue are used for

crosslinking with a polyvalent metal in order to form a molded object. The resulting molded object has improved solvent resistance and is insoluble in organic solvent. Therefore, Ishii fails to teach a cellulose acetate which is soluble in an organic solvent as well as having a free carboxyl group. Seo also fails to teach this feature of the present invention. Accordingly, the combination of Ishii and Seo does not make the present invention *prima facie* obvious.

Still further, since the cellulose acetate according to the present invention has a free carboxyl group and is soluble in an organic solvent, a dope containing this cellulose acetate exhibits improved spinnability properties. A film obtained by casting the dope also exhibits significantly improved releasability properties. Neither Ishii nor Seo appreciate these benefits.

Inasmuch as Ishii and Seo individually do not render the presently claimed invention *prima facie* obvious, and the defects are not cured by their combination, the rejection of claims 18-21 under 35 U.S.C. § 103(a) over these two references should not be sustained.

C. Conclusion

Ishii describes a process that involves esterifying cellulose with a polybasic carboxylic acid. The resulting mixed ester of cellulose is then immersed in a solution of a divalent or higher metal salt in order to effect crosslinking, thereby increasing solvent resistance. See Ishii, column 2, lines 37-41.

In the present invention, on the other hand, a cellulose that originally has a

carboxyl group is acetylated and then a heat stabilizer (e.g., an alkali metal or alkaline earth metal) is added to the resulting cellulose acetate. The carboxyl group is believed to form a salt with the alkali metal or alkaline earth metal. A carboxyl group derived from a raw cellulose acetate is stronger than acetic acid ($\text{pK}_a = 4.73$). Thus, an acid stronger than acetic acid is required in order to retain the carboxyl group derived from raw material cellulose as a free carboxyl group. Therefore, by using (or adding) an acid ~~stronger than acetic acid~~ (having the recited pK_a 1.93 to 4.50), the carboxyl group which is believed to form the salt can efficiently be retained in the form of a free carboxyl group. However, when the acidity of the acid is very strong, the cellulose acetate will deteriorate. Accordingly, ~~the present invention employs a precisely defined strength of acid~~ ($\text{pK}_a = 1.93$ to 4.50).

Thus, the role of the acid of Ishii is strikingly different from its role in the present invention. It could not have been predicted based upon the teachings of Ishii that carboxyl groups derived from a cellulose raw material could be made to retain the form of free carboxyl groups by the use of acids as specified herein.

Moreover, ~~unexpected~~ beneficial effects are obtained in accordance with the present invention. Ishii fails to teach or suggest the releasability, optical characteristics, and spinnability that characterize the composition of the present invention. In particular, Ishii requires the treatment of a carboxyl group with a divalent or higher metal salt for high ~~solvent resistance~~ of the cellulose ester. Ishii neither teaches nor suggests that such properties could be obtained by

carboxyl group containing cellulose derivative soluble in an organic solvent as required by the present claims.

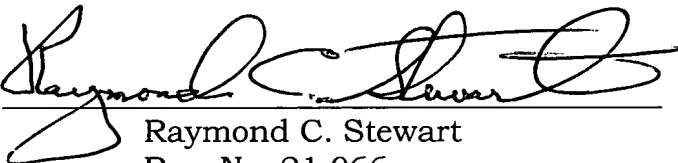
As discussed above, the teachings of Ishii do not render the present invention *prima facie* obvious. Accordingly, the rejections based upon the Ishii reference should not be sustained.

The required Appeal Brief fee in the amount of \$310.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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9. APPENDIX

1. A cellulose acetate obtained by the reaction of a cellulose, which may contain a hemicellulose, with acetic anhydride in the presence of a sulfuric acid catalyst and having at least one feature selected from the group consisting of:

- (i) said cellulose acetate has carboxyl groups wherein at least part of the carboxyl groups are free carboxyl groups;
- (ii) said cellulose acetate contains at least one member selected from the group consisting of an acid having an acid dissociation exponent pKa of 1.93 to 4.50 in water, an alkali metal salt of said acid, and an alkaline earth metal salt of said acid to generate free carboxyl groups; and
- (iii) said cellulose acetate contains an alkali metal or an alkaline earth metal, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent, to generate free carboxyl groups,

wherein said cellulose acetate is soluble in an organic solvent.

2. A cellulose acetate according to Claim 1 having at least feature (iii), wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 2.5×10^{-6} equivalent or less in terms of ion equivalent.

3. A cellulose acetate according to Claim 2, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 1×10^{-6} equivalent or less in terms of ion equivalent.

4. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the acid has a pKa value of 2.0 to 4.4.

5. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the acid is at least one organic acid selected from the group consisting of an aliphatic monocarboxylic acid, an aliphatic polycarboxylic acid, a hydroxycarboxylic acid, and an amino acid.

6. A cellulose acetate according to Claim 5, wherein the acid is at least one organic acid selected from the group consisting of a saturated or unsaturated C₁₋₃ monocarboxylic acid, a saturated or unsaturated C₂₋₄ dicarboxylic acid, a C₁₋₆ hydroxycarboxylic acid, and an amino acid.

7. A cellulose acetate according to Claim 6, wherein the acid is at least one member selected from the group consisting of formic acid, haloacetic acid, halopropionic acid, acrylic acid, malonic acid, succinic acid, glutaric acid, fumaric acid, glycolic acid, lactic acid, malic acid, tartaric acid, and citric acid.

8. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-9} to 3×10^{-5} mole relative to 1 gram of the cellulose acetate.

9. A cellulose acetate according to Claim 8, wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-8} to 2×10^{-5} mole relative to 1 gram of the cellulose acetate.

10. A cellulose acetate according to Claim 9, wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-7} to 1×10^{-5} mole relative to 1 gram of the cellulose acetate.

11. A cellulose acetate according to Claim 1, wherein the cellulose acetate is in the form of a slurry, and wherein the slurry has a pH of 4.5 to 5.5.

12. A cellulose acetate according to Claim 11, wherein the cellulose acetate is in the form of a slurry having a pH of 4.8 to 6.0.

13. A cellulose acetate according to Claim 1, wherein the average degree of acetylation is from 43.7 to 62.5%.

15. A cellulose acetate according to Claim 1, wherein the cellulose as a raw material is at least one member selected from the group consisting of a wood pulp and a linter pulp.

16. A cellulose acetate according to Claim 15, wherein the cellulose as a raw material is at least one member selected from the group consisting of a hardwood pulp and a softwood pulp.

17. A method of producing a cellulose acetate claimed in Claim 1, which comprises:

- (i) mixing a cellulose acetate and an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water or the metal salt thereof;
- (ii) treating a cellulose acetate with said acid or said metal salt thereof; or
- (iii) adding an alkali metal salt of said acid or an alkaline earth metal salt of said acid to a cellulose acetate such that the total content of said alkali metal and said alkaline earth metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent.

18. A dope containing the cellulose acetate according to Claim 1.

19. A dope containing (a) a cellulose acetate and (b) at least one member selected from the group consisting of an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water, an alkali metal salt of the acid, and an alkaline earth metal salt of the acid.

20. A method for improving the releasability of a film from a support which comprises casting the dope of Claim 18 or 19 on the support.

21. A method for improving spinnability which comprises spinning the dope of Claim 18 or 19.

22. A method of producing a cellulose acetate according to Claim 17, which comprises treating a cellulose with acetic acid, acetylating with acetic anhydride in the presence of a sulfuric acid catalyst to produce a cellulose triacetate, and hydrolyzing or aging the cellulose triacetate using sulfuric acid as a catalyst.



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The real party in interest in this appeal is the Assignee, DAICEL CHEMICAL INDUSTRIES, LTD.

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The carboxyl group content in the cellulose mixed ester of Ishii is at least several times greater than that in the cellulose acetate of the present invention. In more detail, since a very large carboxyl group content is required in order to improve solvent resistance of an article comprising a cellulose mixed ester by crosslinking, carboxyl groups are introduced into the cellulose mixed ester by esterification with a polybasic carboxylic acid. In contrast, the present invention employs the knowledge that a form of a carboxyl group derived from cellulose as a raw material has an effect on releasability in film production processes and spinnability in spinning processes.

Concretely, Ishii discloses that “the preferred degree of polybasic carboxylic acid substitution (for hydroxyl) of the resulting mixed ester of cellulose is above 0.05, particularly above 0.15” and “the preferred total degree of substitution is

above 2.3, particularly above 2.4". Column 2, lines 25-30. Even when the degree of polybasic carboxylic acid substitution is smallest (i.e., it would be estimated that the content of carboxyl group is smallest), the carboxyl group content is at least 5 times larger than that of the present invention. That is, the carboxyl group content of the mixed ester of Ishii can be calculated – on the assumption that the DS of cellulose acetate is 2.4, the polybasic carboxylic acid is maleic anhydride (molecular weight 116), and the molecular weight of an anhydroglucose unit of the mixed ester is 268 – as follows: $0.05 \text{ meq}/268 \text{ g of mixed ester} = 50 \text{ meq}/268 \text{ g of mixed ester} = 19 \text{ meq}/100 \text{ g of mixed ester}$.

In contrast, referring to the present invention, the carboxyl group content in pulp as a raw material is 3 to 7 meq/100 g. Thus, the carboxyl group content in the cellulose acetate of the present invention can be calculated – on the assumption that the DS of cellulose acetate is 2.4 and the molecular weight of an anhydroglucose unit of the cellulose acetate is 263 – as follows: $3 \text{ to } 7 \text{ meq}/100 \text{ g of pulp} = 3 \text{ to } 7 \text{ meq}/(100 \times 263/162) \text{ g of cellulose acetate} = 3 \text{ to } 7 \text{ meq}/162 \text{ g of cellulose acetate} = 2 \text{ to } 4 \text{ meq}/100 \text{ g of cellulose acetate}$. (Incidentally, this carboxyl group content represents the value using bleached kraft pulp – a carboxyl group content using a high purity of dissolving pulp for cellulose acetate would be even smaller.)

In order to emphasize an important difference between the presently claimed compositions and compositions disclosed by the Ishii reference, the present claims expressly refer to free carboxyl group content with respect to all

three of the possible “features” of the invention.

Ishii fails to teach or suggest features (i), (ii), or (iii) of the present invention. In more detail, Ishii requires forming a polyvalent metal salt with a polybasic carboxylic acid residue derived from the esterification reaction of a cellulose and a polybasic carboxylic acid in order to crosslink for improving solvent resistance. Ishii thus does not suggest to generate or retain free carboxyl groups binding to the cellulose acetate which is soluble in an organic solvent.

Moreover, unexpected effects are obtained in accordance with the present invention. Thus, Ishii fails to teach or suggest the releasability, optical characteristics, and spinnability that characterize the composition of the present invention. In particular, Ishii requires the treatment of a carboxyl group with a divalent or higher metal salt for high solvent resistance of the cellulose ester. Ishii certainly does not suggest that such properties could be obtained by carboxyl group containing cellulose derivative soluble in an organic solvent as required by the present claims.

Clearly, the Ishii reference does not render the invention as presently claimed *prima facie* obvious. Accordingly, the rejection of claims 1-13 and 15-22 under 35 U.S.C. § 103(a) over Ishii alone should not be sustained.

B. Seo in view of Ishii

Claims 18-21 were rejected under 35 USC § 103(a) as being obvious over US 5,240,665 (Seo) in view of Ishii. This rejection is respectfully traversed.

Seo describes a process for producing cellulose acetate fibers wherein cellulose acetate, acetone, a metal oxide precursor, acid, and water are mixed to form a solution which is then filtered and spun. According to Seo, the cellulose acetate fiber is produced from a cellulose acetate/acetone dope solution by a dry spinning technique. See column 1, lines 31-34. In Seo, the speed for production of a shaped article is increased without aggravating the tensile properties by adding the metal oxide precursor. Column 2, lines 19-24.

Neither Seo nor Ishii, alone or in combination, discloses the organic solvent-soluble cellulose acetates having carboxyl groups required by the present claims. Moreover, with respect to a dope, Seo fails to disclose or suggest any role for a free carboxyl group binding to the cellulose acetate; instead Seo employs a conventional cellulose acetate. Even if Seo is combined with Ishii, the dope obtained would contain a great deal of a polyvalent metal, thus corresponding to the dope of Comparative Example 1 herein. As reported in lines 2-21 on page 32 of the specification, the releasability of this dope evaluates as “x” (that is, not smoothly). Thus the Seo-type dope cannot match the qualities of the dope defined by the present claims.

Additionally, Ishii promotes the increase of solvent resistance. In Ishii, the carboxyl groups derived from the polybasic carboxylic acid residue are used for

crosslinking with a polyvalent metal in order to form a molded object. The resulting molded object has improved solvent resistance and is insoluble in organic solvent. Therefore, Ishii fails to teach a cellulose acetate which is soluble in an organic solvent as well as having a free carboxyl group. Seo also fails to teach this feature of the present invention. Accordingly, the combination of Ishii and Seo does not make the present invention *prima facie* obvious.

Still further, since the cellulose acetate according to the present invention has a free carboxyl group and is soluble in an organic solvent, a dope containing this cellulose acetate exhibits improved spinnability properties. A film obtained by casting the dope also exhibits significantly improved releasability properties. Neither Ishii nor Seo appreciate these benefits.

Inasmuch as Ishii and Seo individually do not render the presently claimed invention *prima facie* obvious, and the defects are not cured by their combination, the rejection of claims 18-21 under 35 U.S.C. § 103(a) over these two references should not be sustained.

C. Conclusion

Ishii describes a process that involves esterifying cellulose with a polybasic carboxylic acid. The resulting mixed ester of cellulose is then immersed in a solution of a divalent or higher metal salt in order to effect crosslinking, thereby increasing solvent resistance. See Ishii, column 2, lines 37-41.

In the present invention, on the other hand, a cellulose that originally has a

carboxyl group is acetylated and then a heat stabilizer (e.g., an alkali metal or alkaline earth metal) is added to the resulting cellulose acetate. The carboxyl group is believed to form a salt with the alkali metal or alkaline earth metal. A carboxyl group derived from a raw cellulose acetate is stronger than acetic acid ($\text{pK}_a = 4.73$). Thus, an acid stronger than acetic acid is required in order to retain the carboxyl group derived from raw material cellulose as a free carboxyl group. Therefore, by using (or adding) an acid stronger than acetic acid (having the recited pK_a 1.93 to 4.50), the carboxyl group which is believed to form the salt can efficiently be retained in the form of a free carboxyl group. However, when the acidity of the acid is very strong, the cellulose acetate will deteriorate. Accordingly, the present invention employs a precisely defined strength of acid ($\text{pK}_a = 1.93$ to 4.50).

Thus, the role of the acid of Ishii is strikingly different from its role in the present invention. It could not have been predicted based upon the teachings of Ishii that carboxyl groups derived from a cellulose raw material could be made to retain the form of free carboxyl groups by the use of acids as specified herein.

Moreover, unexpected beneficial effects are obtained in accordance with the present invention. Ishii fails to teach or suggest the releasability, optical characteristics, and spinnability that characterize the composition of the present invention. In particular, Ishii requires the treatment of a carboxyl group with a divalent or higher metal salt for high solvent resistance of the cellulose ester. Ishii neither teaches nor suggests that such properties could be obtained by

carboxyl group containing cellulose derivative soluble in an organic solvent as required by the present claims.

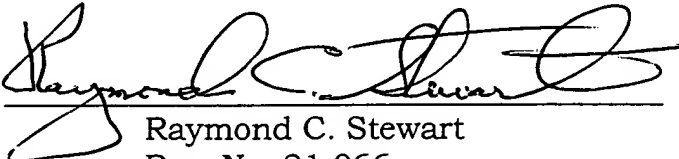
As discussed above, the teachings of Ishii do not render the present invention *prima facie* obvious. Accordingly, the rejections based upon the Ishii reference should not be sustained.

The required Appeal Brief fee in the amount of \$310.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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9. APPENDIX

1. A cellulose acetate obtained by the reaction of a cellulose, which may contain a hemicellulose, with acetic anhydride in the presence of a sulfuric acid catalyst and having at least one feature selected from the group consisting of:

(i) said cellulose acetate has carboxyl groups wherein at least part of the carboxyl groups are free carboxyl groups;

(ii) said cellulose acetate contains at least one member selected from the group consisting of an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water, an alkali metal salt of said acid, and an alkaline earth metal salt of said acid to generate free carboxyl groups; and

(iii) said cellulose acetate contains an alkali metal or an alkaline earth metal, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent, to generate free carboxyl groups,

wherein said cellulose acetate is soluble in an organic solvent.

2. A cellulose acetate according to Claim 1 having at least feature (iii), wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 2.5×10^{-6} equivalent or less in terms of ion equivalent.

3. A cellulose acetate according to Claim 2, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 1×10^{-6} equivalent or less in terms of ion equivalent.

4. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the acid has a pKa value of 2.0 to 4.4.

5. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the acid is at least one organic acid selected from the group consisting of an aliphatic monocarboxylic acid, an aliphatic polycarboxylic acid, a hydroxycarboxylic acid, and an amino acid.

6. A cellulose acetate according to Claim 5, wherein the acid is at least one organic acid selected from the group consisting of a saturated or unsaturated C₁₋₃ monocarboxylic acid, a saturated or unsaturated C₂₋₄ dicarboxylic acid, a C₁₋₆ hydroxycarboxylic acid, and an amino acid.

7. A cellulose acetate according to Claim 6, wherein the acid is at least one member selected from the group consisting of formic acid, haloacetic acid, halopropionic acid, acrylic acid, malonic acid, succinic acid, glutaric acid, fumaric acid, glycolic acid, lactic acid, malic acid, tartaric acid, and citric acid.

8. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-9} to 3×10^{-5} mole relative to 1 gram of the cellulose acetate.

9. A cellulose acetate according to Claim 8, wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-8} to 2×10^{-5} mole relative to 1 gram of the cellulose acetate.

10. A cellulose acetate according to Claim 9, wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-7} to 1×10^{-5} mole relative to 1 gram of the cellulose acetate.

11. A cellulose acetate according to Claim 1, wherein the cellulose acetate is in the form of a slurry, and wherein the slurry has a pH of 4.5 to 5.5.

12. A cellulose acetate according to Claim 11, wherein the cellulose acetate is in the form of a slurry having a pH of 4.8 to 6.0.

13. A cellulose acetate according to Claim 1, wherein the average degree of acetylation is from 43.7 to 62.5%.

15. A cellulose acetate according to Claim 1, wherein the cellulose as a raw material is at least one member selected from the group consisting of a wood pulp and a linter pulp.

16. A cellulose acetate according to Claim 15, wherein the cellulose as a raw material is at least one member selected from the group consisting of a hardwood pulp and a softwood pulp.

17. A method of producing a cellulose acetate claimed in Claim 1, which comprises:

(i) mixing a cellulose acetate and an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water or the metal salt thereof;

(ii) treating a cellulose acetate with said acid or said metal salt thereof; or

(iii) adding an alkali metal salt of said acid or an alkaline earth metal salt of said acid to a cellulose acetate such that the total content of said alkali metal and said alkaline earth metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent.

18. A dope containing the cellulose acetate according to Claim 1.

19. A dope containing (a) a cellulose acetate and (b) at least one member selected from the group consisting of an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water, an alkali metal salt of the acid, and an alkaline earth metal salt of the acid.

20. A method for improving the releasability of a film from a support which comprises casting the dope of Claim 18 or 19 on the support.

21. A method for improving spinnability which comprises spinning the dope of Claim 18 or 19.

22. A method of producing a cellulose acetate according to Claim 17, which comprises treating a cellulose with acetic acid, acetylating with acetic anhydride in the presence of a sulfuric acid catalyst to produce a cellulose triacetate, and hydrolyzing or aging the cellulose triacetate using sulfuric acid as a catalyst.



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PATENT
Docket No. 2224-142P

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of : Before the Board of Appeals
Yukiko NAKANISHI et al. : Appeal No.:
Serial No.: 09/145,987 : Group: 1623
Filed: September 3, 1998 : Examiner: E. WHITE
For: CELLULOSE ACETATE AND DOPE CONTAINING THE SAME

June 8, 2001

APPEAL BRIEF



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TABLE OF CONTENTS

1.	<u>REAL PARTY IN INTEREST</u>	1
2.	<u>RELATED APPEALS AND INTERFERENCES</u>	2
3.	<u>STATUS OF CLAIMS</u>	2
4.	<u>STATUS OF AMENDMENTS</u>	2
5.	<u>SUMMARY OF THE INVENTION</u>	2-4
6.	<u>ISSUES</u>	5
7.	<u>GROUPING OF CLAIMS</u>	5
8.	<u>ARGUMENTS</u>	5
	A. <u>The Ishii reference</u>	5-8
	B. <u>Seo in view of Ishii</u>	9-10
	C. <u>Conclusion</u>	10-12
9.	<u>APPENDIX</u>	13-17



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APPEAL BRIEF

Assistant Commissioner for Patents
Washington, D.C. 20231

June 8, 2001

Sir:

This Appeal Brief is respectfully submitted on behalf of the Appellants in connection with the above-identified application.

This is an appeal from the Final Rejection of claims 1-13 and 15-22, which claims were finally rejected in the Office Action dated December 21, 2000. A Notice of Appeal was filed on April 18, 2001.

1. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Assignee, DAICEL CHEMICAL INDUSTRIES, LTD.

2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

3. STATUS OF CLAIMS

Claims 1-13 and 15-22 are pending in this application, and the rejections thereof are hereby Appealed.

4. STATUS OF AMENDMENTS

No Amendment was filed subsequent to the mailing of the Final Rejection. The statement in the Advisory Action of April 2, 2001 that a proposed Amendment will be entered upon Appeal referred to Applicants' non-amendatory Response filed March 15, 2001.

5. SUMMARY OF THE INVENTION

Cellulose acetate is useful for the production of films and fibers. When used as a substrate for photosensitive materials, as a liquid crystal protective film, or as a color film, cellulose triacetate film is required to have satisfactory optical characteristics, including high transparency, a low yellowness index, low haze characteristics, and low birefringence. When cellulose diacetate is used in the production of fibers, it is required to have good spinnability characteristics. Specification, page 1, lines 4-23.

Cellulose acetate film is generally produced by the acetylation of pulp, casting a solution (dope) containing the resulting cellulose acetate and a solvent onto a support, and releasing the resulting film from the support. The use of a linter pulp generally makes this process too costly. Supplies of high purity softwood pulp are not consistently available. Low purity softwood pulp produces cellulose acetate that is insufficiently transparent. Hardwood pulp provides a cast film with unsatisfactory release properties. Also, cellulose acetate obtained from low purity pulp has decreased spinnability. Specification, page 1, line 24 – page 2, line 16.

In one embodiment, the present invention is based upon the discovery that the form of the carboxyl group binding to the cellulose acetate has a remarkable effect on the releasability and transparency of a cellulose acetate film and on the spinnability of a cellulose acetate dope. In another embodiment, the present invention is based upon the discovery that the alkali or alkaline earth metal content in the cellulose acetate has a remarkable effect on the releasability and transparency of a cellulose acetate film and on the spinnability of a cellulose acetate dope. Specification, page 3, lines 8-15.

In a first aspect, the present invention provides a cellulose acetate obtained by the reaction of a cellulose with acetic anhydride in the presence of a sulfuric acid catalyst, wherein (i) the cellulose acetate has carboxyl groups and at least part of the carboxyl groups are free carboxyl groups. In this aspect, preferably at least about 30 mole-% of the total carboxyl groups bound to the cellulose acetate

are free carboxyl groups. Specification, page 13, lines 17-27.

In a second aspect, the present invention provides a cellulose acetate obtained by the reaction of a cellulose with acetic anhydride in the presence of a sulfuric acid catalyst, wherein (ii) the cellulose acetate contains an acid having an acid dissociation exponent pKa of 1.93 to 4.50 in water, or an alkali or alkaline earth metal salt of that acid, to generate free carboxyl groups. Claim 1. The total content of the acid and metal salt thereof is set at a level which does not interfere with releasability, transparency, or spinnability. Specification, page 17, line 22 – page 18, line 3.

In a third aspect, the present invention provides a cellulose acetate obtained by the reaction of a cellulose with acetic anhydride in the presence of a sulfuric acid catalyst, wherein (iii) the cellulose acetate contains an alkali or alkaline earth metal and the total content of the metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent, to generate free carboxyl groups. Claim 1. The maximum level of the metal is set at a level that does not interfere with heat resistance of the cellulose acetate. Specification, page 19, lines 2-23.

In summary, then, a crucial feature of the present invention resides in the fact that a carboxyl group derived from cellulose as a raw material is retained in the form of a free carboxyl group, for example by using or adding an acid having a pKa of 1.93-4.50, that is, stronger than acetic acid.

6. ISSUES

The sole issues on appeal are whether claims 1-13 and 15-22 are unpatentable under 35 USC 103(a) over Ishii, and whether claims 18-21 are unpatentable under 35 USC 103(a) over Seo in view of Ishii.

The rejection under 35 USC 112 that was stated in the Final Rejection has been withdrawn – see the Advisory Action that was mailed on April 2, 2001.

7. GROUPING OF CLAIMS

Claims 1-13 and 15-22 distinguish over the references of record as discussed hereinbelow. Claims 2 and 3 distinguish over the references of record for all of the reasons relevant to claims 1, 4-13, and 15-22, and for an additional reason, as discussed hereinbelow.

8. ARGUMENTS

A. The Ishii reference

Claims 1-13 and 15-22 were rejected under 35 USC § 103(a) as being unpatentable over US 3,816,150 (Ishii). This rejection is respectfully traversed.

CLAIMS 2 AND 3. The Final Rejection contains language, the sense of which is:

Applicants argue against the rejection on the grounds that the Ishii patent fails to teach the characteristics (i)-(iii) of the present invention. This argument is not persuasive since the Ishii patent does indeed teach a cellulose acetate comprising at least one of the claimed characteristics, namely, feature (ii).

Page 2, paragraph number 6. This analysis by the Examiner ignores the fact that claims 2 and 3 require at least feature (iii). It is respectfully submitted therefore, that claims 2 and 3 are separately patentable for this additional reason.

Ishii describes a process for making modified cellulose acetate which comprises forming or molding a mixed cellulose ester. The ester is made by esterifying (a) cellulose with (b) acetic acid and (c) polybasic carboxylic acid. The molded product is then treated with a liquid treating agent which consists of an aqueous solution of a water-soluble, polyvalent metal salt. According to Ishii, the mixed ester of cellulose is treated with a divalent or higher metal salt in order to increase the solvent resistance. See Ishii, column 2, lines 37-41.

The carboxyl group content in the cellulose mixed ester of Ishii is at least several times greater than that in the cellulose acetate of the present invention. In more detail, since a very large carboxyl group content is required in order to improve solvent resistance of an article comprising a cellulose mixed ester by crosslinking, carboxyl groups are introduced into the cellulose mixed ester by esterification with a polybasic carboxylic acid. In contrast, the present invention employs the knowledge that a form of a carboxyl group derived from cellulose as a raw material has an effect on releasability in film production processes and spinnability in spinning processes.

Concretely, Ishii discloses that “the preferred degree of polybasic carboxylic acid substitution (for hydroxyl) of the resulting mixed ester of cellulose is above 0.05, particularly above 0.15” and “the preferred total degree of substitution is

above 2.3, particularly above 2.4". Column 2, lines 25-30. Even when the degree of polybasic carboxylic acid substitution is smallest (i.e., it would be estimated that the content of carboxyl group is smallest), the carboxyl group content is at least 5 times larger than that of the present invention. That is, the carboxyl group content of the mixed ester of Ishii can be calculated – on the assumption that the DS of cellulose acetate is 2.4, the polybasic carboxylic acid is maleic anhydride (molecular weight 116), and the molecular weight of an anhydroglucose unit of the mixed ester is 268 – as follows: $0.05 \text{ meq}/268 \text{ g of mixed ester} = 50 \text{ meq}/268 \text{ g of mixed ester} = 19 \text{ meq}/100 \text{ g of mixed ester}$.

In contrast, referring to the present invention, the carboxyl group content in pulp as a raw material is 3 to 7 meq/100 g. Thus, the carboxyl group content in the cellulose acetate of the present invention can be calculated – on the assumption that the DS of cellulose acetate is 2.4 and the molecular weight of an anhydroglucose unit of the cellulose acetate is 263 – as follows: $3 \text{ to } 7 \text{ meq}/100 \text{ g of pulp} = 3 \text{ to } 7 \text{ meq}/(100 \times 263/162) \text{ g of cellulose acetate} = 3 \text{ to } 7 \text{ meq}/162 \text{ g of cellulose acetate} = 2 \text{ to } 4 \text{ meq}/100 \text{ g of cellulose acetate}$. (Incidentally, this carboxyl group content represents the value using bleached kraft pulp – a carboxyl group content using a high purity of dissolving pulp for cellulose acetate would be even smaller.)

In order to emphasize an important difference between the presently claimed compositions and compositions disclosed by the Ishii reference, the present claims expressly refer to free carboxyl group content with respect to all

three of the possible “features” of the invention.

Ishii fails to teach or suggest features (i), (ii), or (iii) of the present invention. In more detail, Ishii requires forming a polyvalent metal salt with a polybasic carboxylic acid residue derived from the esterification reaction of a cellulose and a polybasic carboxylic acid in order to crosslink for improving solvent resistance. Ishii thus does not suggest to generate or retain free carboxyl groups binding to the cellulose acetate which is soluble in an organic solvent.

Moreover, unexpected effects are obtained in accordance with the present invention. Thus, Ishii fails to teach or suggest the releasability, optical characteristics, and spinnability that characterize the composition of the present invention. In particular, Ishii requires the treatment of a carboxyl group with a divalent or higher metal salt for high solvent resistance of the cellulose ester. Ishii certainly does not suggest that such properties could be obtained by carboxyl group containing cellulose derivative soluble in an organic solvent as required by the present claims.

Clearly, the Ishii reference does not render the invention as presently claimed *prima facie* obvious. Accordingly, the rejection of claims 1-13 and 15-22 under 35 U.S.C. § 103(a) over Ishii alone should not be sustained.

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Neither Seo nor Ishii, alone or in combination, discloses the organic solvent-soluble cellulose acetates having carboxyl groups required by the present claims. Moreover, with respect to a dope, Seo fails to disclose or suggest any role for a free carboxyl group binding to the cellulose acetate; instead Seo employs a conventional cellulose acetate. Even if Seo is combined with Ishii, the dope obtained would contain a great deal of a polyvalent metal, thus corresponding to the dope of Comparative Example 1 herein. As reported in lines 2-21 on page 32 of the specification, the releasability of this dope evaluates as "x" (that is, not smoothly). Thus the Seo-type dope cannot match the qualities of the dope defined by the present claims.

Additionally, Ishii promotes the increase of solvent resistance. In Ishii, the carboxyl groups derived from the polybasic carboxylic acid residue are used for

crosslinking with a polyvalent metal in order to form a molded object. The resulting molded object has improved solvent resistance and is insoluble in organic solvent. Therefore, Ishii fails to teach a cellulose acetate which is soluble in an organic solvent as well as having a free carboxyl group. Seo also fails to teach this feature of the present invention. Accordingly, the combination of Ishii and Seo does not make the present invention *prima facie* obvious.

Still further, since the cellulose acetate according to the present invention has a free carboxyl group and is soluble in an organic solvent, a dope containing this cellulose acetate exhibits improved spinnability properties. A film obtained by casting the dope also exhibits significantly improved releasability properties. Neither Ishii nor Seo appreciate these benefits.

Inasmuch as Ishii and Seo individually do not render the presently claimed invention *prima facie* obvious, and the defects are not cured by their combination, the rejection of claims 18-21 under 35 U.S.C. § 103(a) over these two references should not be sustained.

C. Conclusion

Ishii describes a process that involves esterifying cellulose with a polybasic carboxylic acid. The resulting mixed ester of cellulose is then immersed in a solution of a divalent or higher metal salt in order to effect crosslinking, thereby increasing solvent resistance. See Ishii, column 2, lines 37-41.

In the present invention, on the other hand, a cellulose that originally has a

carboxyl group is acetylated and then a heat stabilizer (e.g., an alkali metal or alkaline earth metal) is added to the resulting cellulose acetate. The carboxyl group is believed to form a salt with the alkali metal or alkaline earth metal. A carboxyl group derived from a raw cellulose acetate is stronger than acetic acid ($\text{pK}_a = 4.73$). Thus, an acid stronger than acetic acid is required in order to retain the carboxyl group derived from raw material cellulose as a free carboxyl group. Therefore, by using (or adding) an acid stronger than acetic acid (having the recited pK_a 1.93 to 4.50), the carboxyl group which is believed to form the salt can efficiently be retained in the form of a free carboxyl group. However, when the acidity of the acid is very strong, the cellulose acetate will deteriorate. Accordingly, the present invention employs a precisely defined strength of acid ($\text{pK}_a = 1.93$ to 4.50).

Thus, the role of the acid of Ishii is strikingly different from its role in the present invention. It could not have been predicted based upon the teachings of Ishii that carboxyl groups derived from a cellulose raw material could be made to retain the form of free carboxyl groups by the use of acids as specified herein.

Moreover, unexpected beneficial effects are obtained in accordance with the present invention. Ishii fails to teach or suggest the releasability, optical characteristics, and spinnability that characterize the composition of the present invention. In particular, Ishii requires the treatment of a carboxyl group with a divalent or higher metal salt for high solvent resistance of the cellulose ester. Ishii neither teaches nor suggests that such properties could be obtained by

carboxyl group containing cellulose derivative soluble in an organic solvent as required by the present claims.

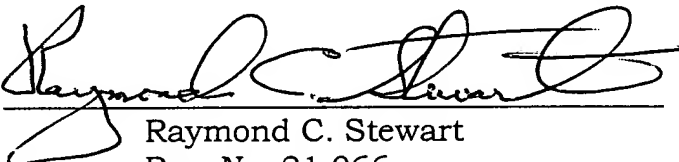
As discussed above, the teachings of Ishii do not render the present invention *prima facie* obvious. Accordingly, the rejections based upon the Ishii reference should not be sustained.

The required Appeal Brief fee in the amount of \$310.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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(i) said cellulose acetate has carboxyl groups wherein at least part of the carboxyl groups are free carboxyl groups;

(ii) said cellulose acetate contains at least one member selected from the group consisting of an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water, an alkali metal salt of said acid, and an alkaline earth metal salt of said acid to generate free carboxyl groups; and

(iii) said cellulose acetate contains an alkali metal or an alkaline earth metal, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent, to generate free carboxyl groups,

wherein said cellulose acetate is soluble in an organic solvent.

2. A cellulose acetate according to Claim 1 having at least feature (iii), wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 2.5×10^{-6} equivalent or less in terms of ion equivalent.

3. A cellulose acetate according to Claim 2, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose acetate is 1×10^{-6} equivalent or less in terms of ion equivalent.

4. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the acid has a pKa value of 2.0 to 4.4.

5. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the acid is at least one organic acid selected from the group consisting of an aliphatic monocarboxylic acid, an aliphatic polycarboxylic acid, a hydroxycarboxylic acid, and an amino acid.

6. A cellulose acetate according to Claim 5, wherein the acid is at least one organic acid selected from the group consisting of a saturated or unsaturated C₁₋₃ monocarboxylic acid, a saturated or unsaturated C₂₋₄ dicarboxylic acid, a C₁₋₆ hydroxycarboxylic acid, and an amino acid.

7. A cellulose acetate according to Claim 6, wherein the acid is at least one member selected from the group consisting of formic acid, haloacetic acid, halopropionic acid, acrylic acid, malonic acid, succinic acid, glutaric acid, fumaric acid, glycolic acid, lactic acid, malic acid, tartaric acid, and citric acid.

8. A cellulose acetate according to Claim 1 having at least feature (ii), wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-9} to 3×10^{-5} mole relative to 1 gram of the cellulose acetate.

9. A cellulose acetate according to Claim 8, wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-8} to 2×10^{-5} mole relative to 1 gram of the cellulose acetate.

10. A cellulose acetate according to Claim 9, wherein the total content of the acid, the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-7} to 1×10^{-5} mole relative to 1 gram of the cellulose acetate.

11. A cellulose acetate according to Claim 1, wherein the cellulose acetate is in the form of a slurry, and wherein the slurry has a pH of 4.5 to 5.5.

12. A cellulose acetate according to Claim 11, wherein the cellulose acetate is in the form of a slurry having a pH of 4.8 to 6.0.

13. A cellulose acetate according to Claim 1, wherein the average degree of acetylation is from 43.7 to 62.5%.

15. A cellulose acetate according to Claim 1, wherein the cellulose as a raw material is at least one member selected from the group consisting of a wood pulp and a linter pulp.

16. A cellulose acetate according to Claim 15, wherein the cellulose as a raw material is at least one member selected from the group consisting of a hardwood pulp and a softwood pulp.

17. A method of producing a cellulose acetate claimed in Claim 1, which comprises:

(i) mixing a cellulose acetate and an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water or the metal salt thereof;

(ii) treating a cellulose acetate with said acid or said metal salt thereof; or

(iii) adding an alkali metal salt of said acid or an alkaline earth metal salt of said acid to a cellulose acetate such that the total content of said alkali metal and said alkaline earth metal in 1 gram of the cellulose acetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent.

18. A dope containing the cellulose acetate according to Claim 1.

19. A dope containing (a) a cellulose acetate and (b) at least one member selected from the group consisting of an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water, an alkali metal salt of the acid, and an alkaline earth metal salt of the acid.

20. A method for improving the releasability of a film from a support which comprises casting the dope of Claim 18 or 19 on the support.

21. A method for improving spinnability which comprises spinning the dope of Claim 18 or 19.

22. A method of producing a cellulose acetate according to Claim 17, which comprises treating a cellulose with acetic acid, acetylating with acetic anhydride in the presence of a sulfuric acid catalyst to produce a cellulose triacetate, and hydrolyzing or aging the cellulose triacetate using sulfuric acid as a catalyst.